

DEGRADATION OF DISLODGEABLE
DIAZINON RESIDUE ON CHINESE CABBAGE
AND BROCCOLI FOLIAGE IN SANTA BARBARA
AND SAN LUIS OBISPO COUNTIES

By

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SUMMARY

During spring and early summer of 1984, five Chinese cabbage and broccoli fields were treated with Diazinon, then monitored for foliar decay of the pesticide. Dislodgeable residue from the leaf surface was monitored for one week. All samples collected were below the current estimated safe level for Diazinon. A large margin of safety was seen between the samples collected at 24 hours after the application and this current estimated safe level, supporting the current reentry interval (spray is dry) on the crops monitored.

INTRODUCTION

In June 1971, the California Department of Food and Agriculture established reentry intervals for specific crop/pesticide combinations. A reentry interval is the time period that must elapse between the application of a pesticide and the entry of unprotected workers into the treated area. This waiting period was instituted to allow sufficient time for toxic materials to environmentally degrade to a lower hazard residue level. This study was conducted to monitor the foliar decay rate of Diazinon and evaluate the current safety interval.

Diazinon is a broad spectrum contact insecticide and acaricide, used widely for agricultural and structural pests. It is sold in California in various formulations including wettable powders, emulsifiable concentrates and granuals. Depending on the concentration, the signal words Caution or Warning are found on the label. The oral LD₅₀ (rat) of technical grade Diazinon is 76 mg/kg (Gaines, 1960) and the dermal LD₅₀ (rat) is 455 mg/kg (Gaines, 1960).

METHODS

With assistance from the Santa Barbara and San Luis Obispo County Agricultural Commissioners' staff, and local Pest Control Operators (PCO), five fields treated with Diazinon were monitored. Four chinese cabbage fields and one broccoli field were each monitored for foliar decay of Diazinon for a one week period after the application. All five fields, received the maximum application rate specified on the label, of 1 pound (0.5 lbs. a.i.) of Diazinon 50W per acre applied by ground in a tank mix of 50 to 65 gallons of water per acre. Each field was divided into three areas. A fifty foot section of one row from each area was selected and identified with markers for sampling. Three replicate samples were taken each time the field was sampled. Each replicate sample consisted of 45 leaf punches, a composite of 15 leaf punches from each of the three marked rows. The samples were collected using a 2.5 cm disk leaf punch which was cleaned with alcohol between samples. A pre-application sample was taken the day before, or the morning of, the application. The first post-application sample was taken 1 to 4 hours after the application then again daily for up to 4 more days. One more sample was collected 7 days after the application. All samples were collected in jars and sealed with aluminum foil, then placed on ice for shipment to Chemistry Laboratory Services in Sacramento for next-day analysis. Application parameters, irrigation schedules, and crop for each plot are reported in Appendix A.

The daily high and low air temperatures and precipitation were recorded by a nearby local weather station and made available through the National Weather Service (Appendix B).

Laboratory analysis consisted of washing the leaf punch samples three times in an aqueous surfactant solution. The washings were combined and extracted three times with ethyl acetate. The ethyl acetate extract was de-watered by decanting through anhydrous sodium sulfate, brought to final volume, then analyzed by gas chromatography.

RESULTS AND DISCUSSION

The analytical results for each composite sample and the averages for each day are presented in Table 1. The minimum detectable level (0.0002 ug/cm^2) was used in calculating the average of replicates for each sample under the detection limit. Minimum and maximum air temperatures and precipitation during the study are reported in Appendix B. The degradation curve showing the combined averages and ranges of the five fields is presented in Figure 1.

The current estimated safe level for reentry into a field treated with Diazinon is 4.0 ug/cm^2 of leaf surface (Maddy, 1985). At this level, an unprotected worker may enter a field to conduct work involving substantial foliage contact and should not experience any acute or chronic illness symptoms. This number was extrapolated using the parathion dermal LD_{50} and the parathion safe level as a reference point.

Workers may not enter a field treated with Diazinon, for the crops monitored in this study, until the spray has dried or the dust has settled from the application. This is based on the potential for Diazinon to cause acute cholinesterase inhibition and infrequency of illnesses associated with it. The data presented here supports this reentry interval based on the current estimated safe level of 4.0 ug/cm^2 . All of the samples collected during this study (including those samples collected only hours after the application) were below this level (Figure 1). The highest sample collected at 24 hours after the application was approximately twenty times lower than the estimated safe level.

TABLE 1

Results of samples collected for each field reported in ug/cm²

			Presample	4-hour	24-Hour	48-hour	72-hour	7-day
Plot 1	Rep 1	ND		.07600	.02550	.02450	.00742	
Cauli-	Rep 2			.06530	.03750	.03050	.00886	
flower	Rep 3			.09030	.03350	.02600	.01150	
Average				.07065	.03150	.02750	.00814	
Plot 2	Rep 1	ND		.37000	.12000	.04000	NS	.00720
Chinese	Rep 2			.40000	.14000	.03000	NS	.01100
Cabbage	Rep 3			.36000	.18000	.04000	NS	.00910
Average				.37667	.14667	.03667		.00910
Plot 3	Rep 1	ND		.35000	.11000	.02000	NS	.00830
Chinese	Rep 2			.38000	.08000	.02000	NS	.00072
Cabbage	Rep 3			.33000	.12000	.02000	NS	ND
Average				.35333	.10333	.02000		
Plot 4	Rep 1	ND		.43000	.10000	.01500	NS	.00980
Chinese	Rep 2			.62000	.10000	.01500	NS	.00067
Cabbage	Rep 3			.68000	.09000	.01000	NS	ND
Average				.57667	.09667	.01333		
Plot 5	Rep 1	NS		.27000	.07000	NS	.01200	.01200
Chinese	Rep 2			.29000	.06000	NS	.01200	.00140
Cabbage	Rep 3			.28000	.06000	NS	.01200	NS
Average				.28000	.06333		.01200	.00670
Average of All Fields				.33277	.08843	.02425	.01063	.00551

NS - Not Sampled

ND - None Detected (The detection was 0.002 ug/cm²; This value was used in calculating means with samples below the detection limit)

APPENDIX A

Application Parameters of Fields Treated With Diazinon

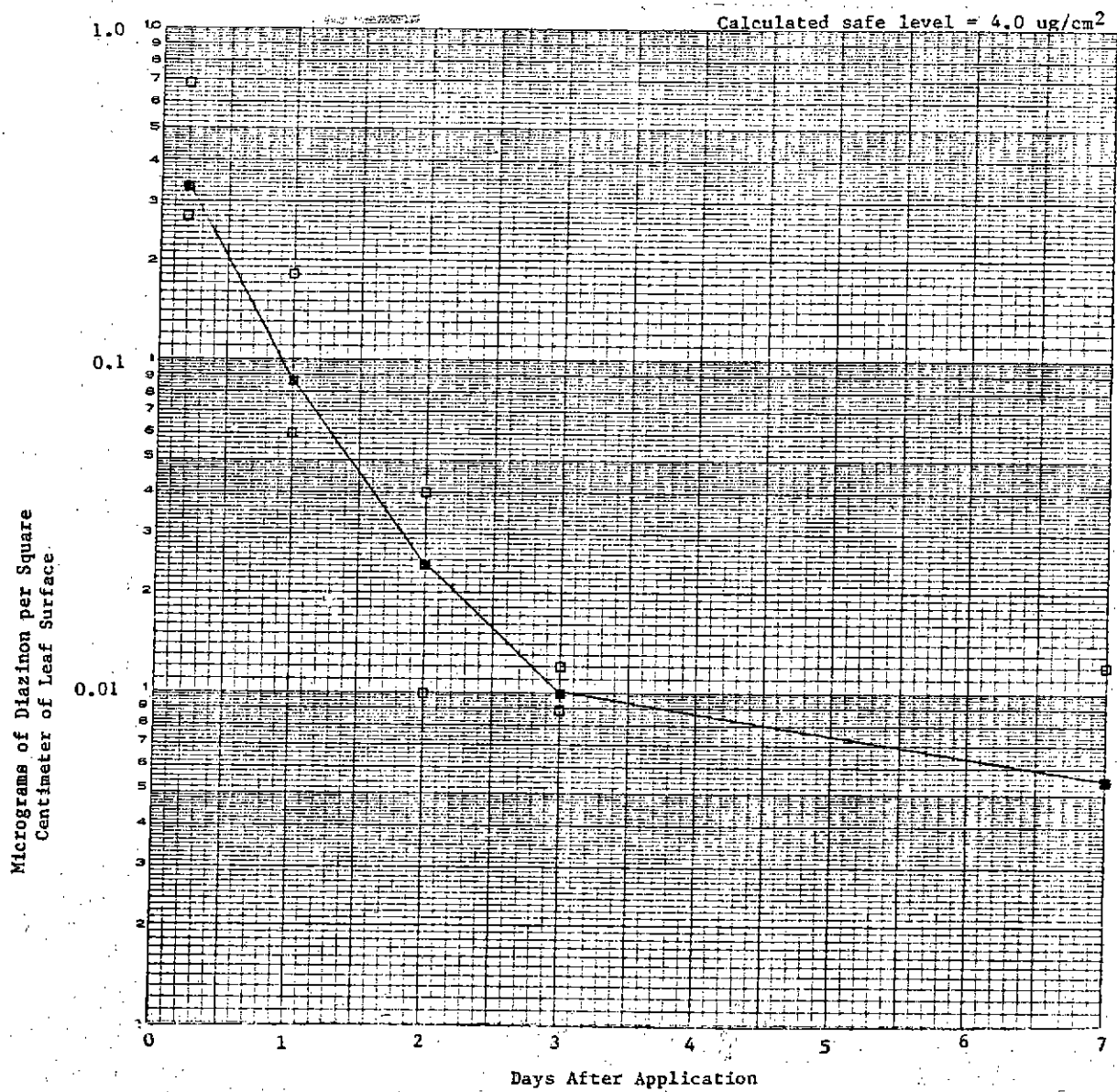
Parameter	P-81 Plot 1	W Plot 2	M Plot 3	E Plot 4	Sanyo Plot 5
Application Rate lbs. a.i./acre	0.5	0.5	0.5	0.5	0.5
Dilution	50	60	60	60	65
Date of Appli- cation	3/19	6/13	6/13	6/13	6/14
Average Plant Height at Application	5"	6"	6"	6"	6"
Irrigation Method	Sprinkler	Furrow	Furrow	Furrow	Sprinkler
Irrigation During Study Period	3/27	6/14 6/19	6/15 6/18 6/26	6/18	6/19
Precipitation	3/31	6/18	6/18	6/18	6/18
Field Location (County)	Santa Barbara	SLO	SLO	SLO	SLO
Crop	Cauli- flower	Chinese cabbage	Chinese cabbage	Chinese cabbage	Chinese cabbage

APPENDIX B

Daily Low and High Air Temperatures and Precipitation Reported by the Santa Maria Weather Station

<u>Date</u>	<u>Low</u>	<u>High</u>	<u>Precipitation</u>	<u>Date</u>	<u>Low</u>	<u>High</u>	<u>Precipitation</u>
Mar. 19	39	83	-0-	June 13	53	67	-0-
20	43	78	-0-	14	53	70	-0-
21	50	73	-0-	15	53	70	-0-
22	41	73	-0-	16	56	74	-0-
23	42	76	-0-	17	54	71	-0-
24	44	61	-0-	18	54	70	-0-
25	42	65	-0-	19	54	67	-0-
26	48	64	-0-	20	49	69	-0-
27	45	76	-0-	21	48	69	-0-
28	41	73	-0-	22	44	73	-0-
29	41	66	-0-	23	54	71	-0-
30	33	68	-0-	24	54	76	-0-
31	40	57	0.08	25	53	75	-0-
Apr. 1	37	60	-0-	26	53	74	-0-
2	33	64	-0-	27	53	77	-0-
3	34	67	-0-	28	56	72	-0-
4	42	60	-0-	29	54	73	-0-
5	48	65	-0-	30	49	72	-0-

FIGURE I



REFERENCES

1. Thomas B. Gaines, The Acute Toxicity of Pesticides to Rats. Toxicology and Applied Pharmacology, Vol. 2, pp. 88-99, 1960.
2. Maddy, K. T., Estimated Safe Levels of Foliar Pesticide Residues to Allow Unprotected Workers Reentry into Fields in California. California Department of Food and Agriculture. Worker Health and Safety Unit. Unpublished report. HS-1280, (1985).